

REMARKS/ARGUMENTS

In response to the Final Office Action of November 2, 2005, Applicant submits herewith the Declaration of Dr. Ajay K. Banga attesting to the unobviousness of the subject matter of independent Claims 1, 33, and 34, from which all of the other claims of the application depend.

Independent Claim 1 stands rejected as being obvious from Park et al. (Publication No. US 2002/0082543 A1) in view of D'Ussel (Publication No. US 2004/0010237 A1).

Claim 1, as originally filed, recited an applicator having a plurality of microneedles carrying functional substances for delivering into the skin, with the microneedles being made of a material capable of disintegration and dispersion into the skin. In the Amendment and Response of September 15, 2005, Claim 1 was amended to additionally recite that the material of the microneedles is substantially sugar that dissolve within the human body.

In rejecting Claim 1, the Office Action of November 2, 2005, states that the Park reference describes the subject matter of Claim 1, except that it does not disclose that the needles are made of a material that is substantially sugars that dissolve in the human body. The Office Action then states that the D'Ussel reference describes a needle made substantially of sugars that dissolves within the human body, and that it would be obvious to modify the Park microneedles with the sugar needle of D'Ussel.

The fallacy in this is that D'Ussel does not disclose "a needle made substantially of sugars" or a "sugar needle." D'Ussel discloses no more than a sharp tip that can be made of a sugar or other material that serves as a closure at the tip of a metal needle (Paragraphs 12, 16, 18, and 19).

The accompanying Declaration establishing unobviousness is authored by a prestigious expert in the field as evidenced by the twenty-eight page Curriculum Vitae which chronicles the vast experience of the Declarant, Dr. Banga, in the field of transdermal delivery and

microporation. From his Curriculum Vitae it is clear that Dr. Banga is well qualified to render an opinion as to the unobviousness of the subject matter of the claims of the present application.

Mercer University, by whom Dr. Banga is employed, purchases microneedles from one of the Assignees of the present application at a standard university research price for academic research by Dr. Banga in experimentations in applying various drug materials. Other than sharing non-confidential research results, neither Mercer University nor Dr. Banga have any relation to the present inventors or their Assignees.

The reasons for Dr. Banga's opinion of unobviousness of the subject matter of Claim 1 are cogently recited in Paragraphs 7-11 of the Declaration, the substance of which are adopted herein. These paragraphs state as follows:

7. This feature of microneedles made substantially of sugar that dissolves within the human body and disintegrates and disperses into the skin for depositing of functional substances into the skin is not disclosed or suggested or obvious from the teachings of the Park and D'Ussel patents.

8. The Park patent does not teach or suggest microneedles made of sugar material. Rather, the Park patent teaches the use of polymers, metals, ceramics, semi-conductor materials and composites. Polymer needles made of biodegradable polymers such as PLGA will release drug very slowly over a period of time to provide sustained drug delivery. This would be a very different application as compared to the present invention where sugar microneedles can quickly dissolve in the skin to provide instant (bolus) drug delivery. Using just a sugar tip from a conventional needle and extrapolating that information to make an all-sugar microneedle will not be obvious to somebody skilled in this art, and also the manufacturing methods will be entirely different.

9. The D'Ussel patent discloses metal, not sugar, microneedles with only a pointed tip of sugar that serves as a seal for temporarily retaining injection liquids in the needles. The tips are formed by vertically immersing the needles in a hot solution of material, which may be sugar, and then raising the needles so that a sharp point is formed. There is no way that an entire microneedle can be formed in this manner as there must be a

substantial portion of the microneedle formed of metal or rigid material on the end of which a drop of sugar can be formed to provide a sharp tip. Dipping a flat base or only partially formed microneedles in a hot bath and removing them would not conceivably result in a needlelike formation.

10. In addition, D'Ussel teaches sterilization of the needles, which would destroy any sugar formulation.

11. The D'Ussel patent does not teach or suggest the use of microneedles and particularly the use of sugar tips on microneedles. Rather, D'Ussel teaches applying tips to conventional needles. There is no known technique for dipping microneedles into a hot sugar solution and having tips formed on the microneedles when the microneedles are removed from the bath. Also, microneedles are very different from conventional needles. The former is a very recent innovative approach to drug delivery while the latter has been used for a very long time.

For these reasons, it is respectfully submitted that the opinion of one highly skilled in the art should be accepted to establish that the subject matter of Claim 1 is unobvious and that Claim 1, along with its dependent Claims 2-32 are allowable.

Independent Claim 33 recites the subject matter of original Claim 1, without the limitation to the material being substantially sugars, and adds the structure of the microneedles having relatively thick inner portions and relatively thick outer portions with constructed intermediate portions therebetween to facilitate separation of the outer portions from the inner portions with the outer portions remaining in the skin. The preferred embodiment of this subject matter is illustrated in Figure 5 of the drawings of this application. This configuration in combination with the microneedles of a material that is capable of disintegration and dispersion into the skin provides a unique and advantageous result in that when the microneedles are applied to the skin the base and the inner portions of the attached microneedles can be removed, leaving the outer portions, in which the functional material is dispersed, in the skin

for disintegration and dispersion. The base and inner portions of the microneedles need not be retained in position on the skin while the outer portions are disintegrating.

The Office Action rejects Claim 33 as being obvious over the Park reference in view of the D'Ussel reference, but, as pointed in the Banga Declaration, there is nothing disclosing or suggesting this feature in these references.

It may be that the Examiner intended to include a rejection of Claim 33 with the rejection of Claims 13 and 32 based on the combination of the Park reference in view of Arias et al. (US 2002/0133129 A1), referring to Figure 15I of Arias. However, Arias discloses no restricted intermediate portion between outer and inner portions that would facilitate separation of the outer portion from the inner portion. Rather, Figure 15I discloses nothing other than a tapering stepped configuration with each portion outwardly of an inner portion being sequentially reduced. The purpose of this, as explained in the Arias reference, is to produce a sharp-pointed needle. It has nothing to do with forming a needle in a structure in which an outer portion can be readily separated from an inner portion, leaving the outer portion in the skin.

Therefore, the subject matter of Claim 33 is clearly not rendered obvious from the combination of the Park and Arias references.

Independent Claim 34 recites the same subject matter of original Claim 1, without the "substantially sugar" limitation of present Claim 1, and adds the feature of microcontainers containing the functional substance and themselves being contained within the microneedles for delivery into the skin. This claim was rejected in the Office Action on the basis of Figure 3 of the Park reference disclosing microcontainers within microneedles. However, as pointed out in the Banga Declaration, Figure 3 of the Park reference has nothing to do with microcontainers. Rather, it discloses a sequence of layers of material forming the microneedle. None of these layers are microcontainers and none of them are contained within the microneedles, but rather

extend fully across the microneedles and form the microneedles themselves rather than being a container within a microneedle.

There is nothing in the Park reference that suggests having microcontainers within microneedles. Therefore, the subject matter of Claim 34 and its dependent Claim 35, is unobvious.

For the foregoing reasons, it is respectfully submitted that Claims 1-35 of the present application are allowable, and reconsideration and allowance are respectfully requested.

Respectfully submitted,



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